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INSTITUTE FOR CIVIL SERVICE EXAMS

SOUTH INDIA'S PREMIER INSTITUTION FOR
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NCERT SCIENCE

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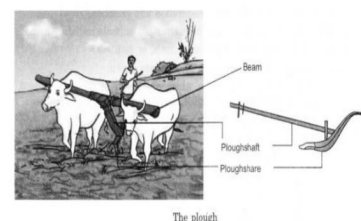
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Chapter 1 Crop Production and Management

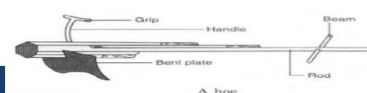
We already know that: All living organisms require food. The energy from food is utilised by an organism for carrying out its various life processes such as digestion, respiration and excretion.

Plants can make their food themselves but animals including humans cannot. We get our food from plants or animals, or both. In our country three categories of crops are grown:

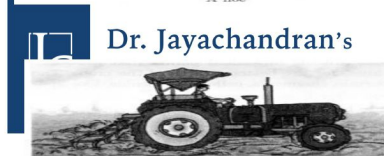
- **Kharif Crops:** The crops which are grown in the rainy season (i.e., from June to September) are called Kharif crops. Paddy, maize, soybean, groundnut, and cotton are Kharif crops.
- **Rabi Crops:** The crops are grown in the winter season (i.e., from October to March) are called rabi crops. Examples of rabi crops are wheat, gram, pea, mustard, and linseed.
- **Zaid Crops (or Summer Crops):** The crops grown in the summer season are (called zaid crops. Moong, muskmelon, watermelon, cucumber, gourd and bitter gourd are examples of zaid crops.
- Cultivation of crops involves the following activities:
- **Soil Preparation:** It involves loosening and tilling of the soil (i.e., ploughing and watering). ?
- **Sowing:** Sowing is the process of putting seeds in the soil.
- **Adding Manure and Fertilisers:** The substances, which are added to the soil in the form of nutrients to improve the production of the crops and fertility of the soil are called manure and fertilisers.
- **Irrigation:** Supply of water to crops at appropriate intervals is called irrigation.
- **Protection from Weeds:** Weeds are the unwanted plants that grow along with the crops. Its removal is a must for the better growth of the crops. These can be controlled by spraying certain chemicals, called weedicides, like 2, 4-D.
- **Harvesting:** The cutting of the crop after it is mature is called harvesting.
- **Storage:** If the crop grains are to be kept for a longer time, they should be safe from moisture, insects and rats.
- **Humus:** Humus is the top layer of the soil formed by decaying or decomposition of organic matters like animal remains, shed leaves, the dung of cattle.
- **Pests:** Pests are the insects or rodents that destroy 'much of our crop yield. Thus, it is necessary to save crops from pests. Important agricultural tools:



The plough



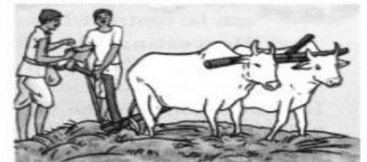
A hoe



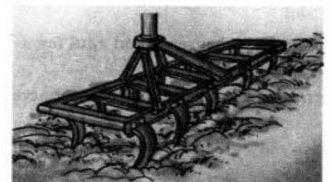
Cultivator driven by a tractor

Notes

- **Plough:** This is used for tilling the soil, adding fertilisers to the crop, removing the weeds, scraping of soil, etc. This implement is made of wood and drawn by a pair of bulls.
- **Hoe:** It is used for removing weeds and for loosening the soil.
- **Cultivator:** Used for ploughing. It is driven by a tractor. Use of cultivator saves labour and time.
- **Traditional Tool:** The tool used traditionally for sowing seeds is shaped like a funnel.
- **Seed Drill:** Used for sowing with the help of tractors. This tool shows the seeds uniformly at a proper distance and depth.
- **Sickle:** Used for manual harvesting.
- **Food from Animals:** Like plants, the animals also provide us with different kinds of food like fish, meat and eggs.
- **Fumigation:** Fumigation is the most effective method for checking the growth of insects by providing smoke or chemicals in the gaseous state without affecting the grain.
- **Agricultural practices:** There are various activities that have to be performed, before sowing and up to harvesting. These are called agricultural practices.
- **Animal husbandry:** Animals reared at home or on a farm, have to be provided with proper food, shelter and care, when this is done on a large scale it is called animal husbandry.
- **Crop:** When plants of the same kind are grown at a place in a regular manner on a large scale, it is called a crop.
- **Fertiliser:** Fertilisers are chemicals which are rich in a particular nutrient like nitrogen, phosphorus and potassium.
- **Granaries:** The harvested grains, usually are stored in huge stores, after they are properly dried in sunlight. Such stores are called granaries.
- **Harvesting:** The cutting of the crop after it is mature is called harvesting.
- **Irrigation:** Supply of water to crops at appropriate intervals is called irrigation.
- **Kharif Crops:** The crops which are grown in the rainy season, that is from June to September are called kharif crops.
- **Manure:** Manures are decomposed organic matter obtained from plant or animal waste.
- **Plough:** The device used for tilling or ploughing is called plough.



Traditional method of sowing



A seed drill



Sickle



- **Rabi Crops:** The crops are grown in the winter season, that is from October to March are called rabi crops.
- **Seeds:** A plant's fertilised ovules, from which a new plant may grow, are called seeds.
- **Silo:** Harvested grains are usually dried before being stored because moisture encourages the growth of microorganism. They are then stored in metal or earthen container, gunny bags. Such stores are also called silo.
- **Sowing:** It is a process to put seeds in the soil.
- **Storage:** It is to keep crop grains safe from moisture, insects and rats for a long time.
- **Threshing:** The process of separation of grains from the chaff in the harvested plant is called threshing.
- **Weeds:** Some undesirable or unwanted plants may grow naturally along with the crop, such plants are called weeds.
- **Weedicides:** Those certain chemicals which are used to control weeds are called weedicides. For example, 2, 4-D (2, 4-dichlorophenoxyacetic acid), metolachlor.
- **Winnowing:** A process to bring out the separation of grain and chaff is called winnowing.

Chapter 2 Microorganisms: Friend and Foe

- Microorganisms are too small and are not visible with the naked eye. They can live in all kinds of environment, ranging from ice cold climate to hot springs, deserts and marshy lands.
- Microorganisms are found in air, water and in the bodies of plants and animals. They may be unicellular or multicellular.
- Microorganisms include bacteria, fungi, protozoa and some algae. Viruses though different from the above-mentioned living organisms are referred to as microbes.
- Viruses are quite different from other microorganisms. They reproduce only inside the cells of the host organism: bacterium, plant or animal.

Friendly Microorganisms

- The bacterium, *Lactobacillus* converts milk into curd. Bacteria are also involved in the making of cheese, pickles and many other food items. *Acetobacter aceti* bacteria is used for the production of acetic acid from alcohol. Yeast is used for commercial production of alcohol and wine by growing them on natural sugars present in grains like barley, wheat, rice and crushed fruit juices etc.

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- Antibiotics are manufactured by growing specific microorganisms and are used to cure a variety of diseases. Some microorganisms reside in the root nodules of leguminous plants. They can fix atmospheric nitrogen from the air into the soil and increase soil fertility.
- Specialized bacteria convert nitrates and nitrites present in the soil into nitrogen gas which is released in the atmosphere. Some microorganisms decompose organic wastes like dead plants and animals into simple substances and clean up the environment.

Harmful Microorganisms

- The bacterium, *Lactobacillus* converts milk into curd. Disease-causing microorganisms are called pathogens. Common ailments like cold, influenza (flu) and most coughs are caused by viruses. Serious diseases like polio and chicken pox are also caused by viruses.
- Diseases like dysentery and malaria are caused by protozoans. Typhoid and tuberculosis (TB) are caused due to bacteria. Some common diseases, their modes of transmission and preventive measures are given below.

Some Common Human Diseases Caused by Microorganisms

Human Disease	Causative Microorganism	Mode of Transmission	Preventive Measures (General)
Tuberculosis	Bacteria	Air	Complete isolation of the patient. Keep the personal belongings of the patient away from those of the others. Vaccination at suitable age and time.
Measles	Virus	Air	
Chicken pox	Virus	Air/Contact	
Polio	Virus	Air/Water	
Cholera	Bacteria	Water/Food	Maintain personal hygiene and good sanitary habits. Consume properly cooked food and boiled drinking water. Vaccination.
Typhoid	Bacteria	Water	
Hepatitis B	Virus	Water	Drink boiled drinking water. Vaccination.
Malaria	Protozoa	Mosquito (female anopheles)	Use mosquito net and repellents, spray insecticides and control breeding of mosquitoes by not allowing water to collect in surroundings.

Foot and mouth disease of cattle is caused by a virus. Anthrax, a bacterial disease is very fatal for human and cattle. Some common diseases caused by plants by microorganisms are given below.

Some of the Common Plant Diseases

Plant Diseases	Microorganism	Mode of Transmission
Citrus Canker	Bacteria	Air
Rust of wheat	Fungi	Insects and seeds
Yellow vein mosaic of bhindi (okra)	Virus	Insect



- **Food Poisoning:** Microorganisms that grow on our food sometimes produce toxic substances. These make the food poisonous and result in serious illness and even death.
- **Food Preservation:** Salts, sugar, edible oils and vinegar are the common chemicals generally used to check the growth of microorganisms. Therefore, they are called **preservatives**. Heat and cold treatments also inhibit the growth of microbes.
- **Pasteurization of Milk:** The milk is heated to 70°C for 15 seconds and then suddenly chilled and stored. Such milk is referred to as pasteurized milk.
- **Symbiotic bacterium:** Rhizobium helps in the fixation of nitrogen with the root of the leguminous plant. The action of lightning also helps into the fixation of nitrogen.
- **Nitrogen cycle:** Nitrogen from the atmosphere is converted into nitrogen compounds by some bacteria like rhizobium and blue-green algae present in the soil and by lightning. On the other hand, certain other bacteria present in the soil convert nitrogen compounds into nitrogen gas that is released to the atmosphere.
- **Algae:** A group of plants which is mostly aquatic. They are autotrophs (i.e., have chlorophyll). Their body is not divided into root, stem and leaf.
- **Antibiotics:** The medicines that kill or stop the growth of disease-causing microorganisms are called antibiotics.
- **Bacteria:** Bacteria are single-celled microorganism. They can be seen only under a microscope. Their cells are prokaryotic (primitive type).
- **Carrier:** The organisms which carry the pathogen from a diseased person to a healthy person are called carriers. For example, female Anopheles mosquito.
- **Communicable Diseases:** Microbial diseases that can be spread from an infected person to a healthy person through the air, water, food or physical contact are called communicable diseases.
- **Fermentation:** The process of conversion of sugar into alcohol by yeast is called fermentation.
- **Fungi:** Fungi are non-green plants. They cannot synthesize their own food. They may be unicellular or multicellular.
- **Lactobacillus:** Lactobacillus is the bacteria responsible for the formation of curd from milk.
- **Microorganisms:** These are organisms that are too small and are not



- visible to the naked eye. These include a virus, bacteria, fungi, protozoa and some algae.
- **Nitrogen Cycle:** A process (cycle) by which the amount of nitrogen remains constant in the atmosphere is known as the nitrogen cycle.
- **Nitrogen Fixation:** The process of conversion of atmospheric nitrogen into its usable forms is called nitrogen fixation.
- **Pasteurisation:** The process in which milk is heated to about 70°C for 15 to 30 seconds and then suddenly cooled.
- **Pathogen:** Disease-causing microorganisms are called pathogens.
- **Preservation:** Prevention of spoiling of food from the action of microorganisms is called food preservation.
- **Protozoa:** Protozoa are unicellular animals.
- **Rhizobium:** Rhizobium is a bacterium which lives in the root nodules of leguminous plants. This helps in the fixation of nitrogen.
- **Vaccine:** The substance which is injected to trigger the body to develop its own defence (by producing antibodies) is called vaccine.
- **Virus:** Viruses are living only inside other living cells. They are considered as connecting link between living and non-living.
- **Yeast:** Yeast is a unicellular fungus.

Chapter 3 Synthetic Fibres and Plastics

- Synthetic fibres and plastics, similar to natural fibres are made up of very large units. The larger units are called polymers. These are made up by combining many similar or dissimilar small units. The small units are called monomers.
- Natural fibres are obtained from plant and animal sources, synthetic fibres are obtained by chemical processing of petrochemicals. The synthetic fibres can be woven into a fabric, just like natural fibres.
- Synthetic fibres have a wide range of uses ranging from many household articles like ropes, buckets, furniture, containers, etc. to highly specialized use in aircrafts, ships, spacecrafts, health care, etc.
- Depending upon the types of chemicals used for the manufacture, some synthetic fibres are rayon, nylon, polyester and acrylic.

Rayon or Artificial Silk

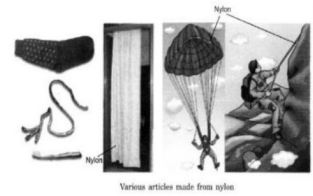


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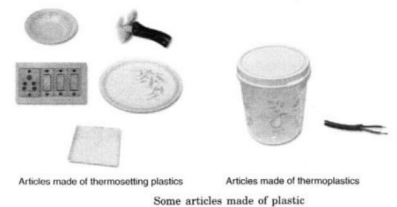
- It is a man-made fibre obtained from a natural source called wood pulp. It can be dyed in a wide variety of colours. Rayon is mixed with cotton to make bedsheets or mixed with wool to make carpets.

Nylon

- It was the first fully synthetic fibre. It was prepared from coal, water and air. Nylon fibres are strong, elastic, light, lustrous and easy to wash. It is used to make many items like socks, ropes, tents, tooth brushes, car seat belts, sleeping bags, curtains etc. Nylon is also used for making parachutes and ropes for rock climbing.

**Polyester**

- It remains crisp, wrinkle-free and easy to wash, so it is quite suitable for making dress material. Terylene can be drawn into very fine fibres that can be woven like any other yarn.
- PET (polyethene terephthalate)** is used for making bottles, utensils, films, wires and many other useful products. Acrylic is artificial wool.
- Characteristics of Synthetic Fibres:** They dry up soon, are durable, less expensive, readily available and easy to maintain.
- Plastics:** All plastics do not have the same kind of arrangement of small units. These can be either linear or cross-linked. Plastics can be easily moulded into any shape. Plastics can be recycled, reused, coloured, melted, rolled into sheets or made into wires. Thermoplastic is a plastic which gets deformed easily on heating and can be bent easily e.g., Polythene and PVC. These are used for manufacturing toys, combs, car grills and various types of containers. Thermosetting Plastics: There are some plastics which when moulded once cannot be softened by heating. These are called thermosetting plastics e.g., bakelite and melamine. Bakelite is used for making electrical switches, handles of various utensils etc. Melamine is used for making floor tiles, kitchenware etc. The waste created by the synthetic fibres and plastics is not environment or ecofriendly. On burning they create poisonous gases. On dumping in the ground they may take years to degenerate. This is because of their non-biodegradable nature.
- We need to use synthetic fibres and plastics in such a manner that we can enjoy their good qualities and at the same time minimise the environmental hazards for the living communities.
- Petrochemicals:** All the synthetic fibres are prepared by a number of processes using raw materials of petroleum origin, called petrochemicals.
- Biodegradable:** Materials which get decomposed through natural processes are called biodegradable.



- **Non-biodegradable:** Those materials which are not easily decomposed by natural processes are called non-biodegradable.
- **Acrylic:** These are the synthetic fibres which resemble natural wool. They are durable and affordable.
- **Artificial Silk:** Artificial silk or rayon is a man-made fibre made from wood pulp. It has properties similar to that of silk.
- **Nylon:** Nylon is a fully synthetic fibre. It is prepared from coal, water and air.
- **Plastic:** Plastic is a polymer like synthetic fibre. Arrangement of units in some plastics is linear whereas in others it is cross-linked.
- **Polyester:** Polyester is a synthetic fibre. Fabric made from this fibre does not get wrinkled easily. It remains crisp and is easy to wash.
- **Polymer:** The word "Polymer" comes from two Greek words, poly meaning many and mer meaning part/unit. So polymer is made of many repeating units.
- **Polythene:** Polythene (Poly + ethene) is an example of thermoplastic. It is used for making commonly used polythene bags.
- **Rayon:** Rayon is also known as artificial silk. It is a man-made fibre made from wood pulp.
- **Synthetic Fibres:** The fibres made by human beings are called synthetic fibres.
- **Terylene:** Terylene is a popular polyester. It can be drawn into very fine fibres that can be woven like any other yarn.
- **Thermoplastics:** Plastics which get deformed easily on heating and can be bent easily are known as thermoplastics.
- **Thermosetting Plastics:** Plastics which when moulded once cannot be softened by heating are called thermosetting plastics.

Chapter 4 Materials: Metals and Non-Metals

Physical Properties of Metals:

Metals are:

- Hard to touch.
- Lustrous i.e., freshly Cut surfaces of metals have characteristic shining.
- malleable; the property of metals by which they can be beaten into thin sheets is called malleability.



- **ductile**; the property of metal by which it can be drawn into wires is called ductility.
- sonorous i.e., metals produce ringing sound when struck on a hard surface.
- Good conductors of heat and electricity.
- Metals like sodium and potassium are soft and can be cut with a knife.
- Mercury is the only metal which is found in the liquid state at room temperature.

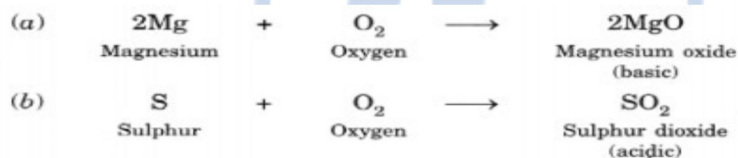
Physical Properties of Non-metals:

- Non-metals are soft and dull (e.g., coal and sulphur).
- Non-metals are generally brittle, i.e., they break down into a powdery mass on tapping with a hammer.
- They are not sonorous.
- They are poor conductors of heat and electricity.

Chemical Properties of Metals and Non-metals: Reaction with Oxygen:

Both metals and non-metals when burnt in oxygen form

their oxides. Oxides of metals are basic in nature while that of non-metals are generally acidic in nature e.g.,



Reaction with Water: Some metals react with water to produce metal hydroxide and hydrogen gas. Generally, non-metals do not react with water.



Reaction with Acids: Metals react with dil. acids and produce metal salt and hydrogen gas. Generally, non-metals do not react with dil. acids.

Reaction with Bases: Metals react with bases to produce hydrogen gas.

Displacement Reaction: More reactive metals displace less reactive metals from their metal compounds in aqueous solutions.

Uses of Metals and Non-metals

- Metals are used in making machinery automobiles, aeroplanes, trains, satellites, industrial gadgets, cooking utensils, water boilers etc.



- Non-metals are also used in day-to-day life. Some examples are: oxygen is essential for life.
- nitrogen, phosphorus and potassium are used as fertilizers. chlorine is used as a water purifier.
- **Atom:** Atom is the smallest particle of matter which cannot be divided further by any physical means. Atoms are the basic units from which molecules and ions are formed.
- **Conductor:** Substances which allow heat/electricity to pass through them are called conductors of heat/electricity
- **Displacement reaction:** More reactive metals displace less reactive metals from their compounds in aqueous solutions.
- **Ductility:** The property of metals by which they can be drawn into wires is called ductility
- **Elements:** Substances whose molecules contain only one type of atoms are known as elements.
- **Hardness:** Metals are hard, on the other hand, non-metals are generally brittle.
- **Malleability:** The property of metals by which they can be beaten into thin sheets is called malleability.
- **Metals:** The materials which are generally hard, lustrous, malleable, ductile, sonorous and good conductors of heat and electricity are called metals
- **Metalloids:** Elements which possess characters of both metals and non-metals are called metalloids.
- **Non-metals:** Materials which are soft, dull in appearance, brittle, not sonorous and poor conductors of heat and electricity are called non-metals.
- **Sonorous:** Metals are called sonorous because they produce a specific ringing sound.

Chapter 5 Coal and Petroleum

- **Natural Resources:** The resources, that are obtained from nature are called natural resources, for example, air, water, soil and minerals.
- **Inexhaustible Natural Resources:** The resources, that are present in unlimited quantity in nature, and cannot be exhausted by human activities, for example, air, sunlight etc.



- **Exhaustible Natural Resources:** The resources, that are present in limited quantity in nature, and can be exhausted by human activities, for example, coal, petroleum, minerals, forests etc.
- **Fossil:** The remains of the part of plants or animals transformed over time, is called fossil.
- Some exhaustible natural resources from the dead remains of living organisms are known as fossil fuels, for example, coal, petroleum and natural gas. Coal is a fossil fuel, that was formed by the decay of vegetation, which existed millions of years ago. It is a non-crystalline form of carbon.
- **Carbonisation:** The slow process of conversion of dead vegetations into coal is called carbonisation. Coke is an amorphous form of carbon, which is harder and denser than charcoal and is used as a fuel. It is obtained by heating soft coal in the absence or little supply of air. It is black in colour. It is used in the manufacture of steel.
- **Destructive Distillation:** The process of heating coal in the absence of air is called destructive distillation. Coal Tar is a black thick liquid, i.e., a mixture of about 200 substances and is used to get various materials of everyday life/industry, like; drugs, dyes, plastics, perfumes, paints, naphthalene balls etc.
- Coal Gas is a by-product, that is obtained during the processing of coal to form coke and is used as a fuel. Petroleum is a fossil fuel, that is obtained by the decomposition of dead animals and plants due to geological changes under the earth. It means oil from the rocks. It is a dark oily liquid that is insoluble in water.
- **Petroleum Refining:** The process of separating the different constituents/fractions of petroleum is known as petroleum refining.
- Natural Gas is a very important fossil fuel, that is stored under high pressure and is easy to transport through pipes and referred to as CNG (compressed natural gas). It is a non-polluting fuel. It helps in the manufacture of a number of chemicals and fertilizers.
- **Coal:** Coal is a fossil fuel, formed by the decay of vegetation which existed millions of years ago.



Various constituents of petroleum and their uses are as follows:

S. No.	Constituents of Petroleum	Uses
1.	Petroleum Gas in Liquid form (LPG)	Fuel for home and industry
2.	Petrol	Motor fuel, aviation fuel, solvent for dry cleaning
3.	Kerosene	Fuel for stoves, lamps and for jet aircrafts
4.	Diesel	Fuel for heavy motor vehicles, electric generators
5.	Lubricating oil	Lubrication
6.	Paraffin wax	Ointment, candles, vaseline etc.
7.	Bitumen	Paints, road surfacing

- **Coal Gas:** Coal gas is obtained as a by-product during the processing of coal to form coke, and is used as a fuel.
- **Coal Tar:** It is a black thick liquid with an unpleasant smell obtained by the processing of coal.
- **Coke:** It is tough, porous and black substance obtained by the processing of coal.
- **Fossil Fuel:** Dead remains of living organisms and buried over millions of years, like coal, petroleum and natural gas are fossil fuels.
- **Natural Gas:** Natural Gas is a very important fossil fuel. It is a cleaner fuel.
- **Petroleum:** It is a dark oily liquid with an unpleasant odour. It is a source of petrol and diesel.
- **Petroleum Refinery:** Petroleum refinery is a place where the process of separating the various constituents of petroleum is carried out.



Chapter 6 Combustion and Flame

- **Combustible Substances:** The substances which burn in the air are called combustible. Oxygen in the air is essential for combustion.
- During the process of combustion, heat and light are given out.
- **Ignition temperature** is the lowest temperature at which a combustible substance catches fire. Inflammable substances have very low ignition temperature. Fire can be controlled by removing one or more requirements essential for producing fire. Water is commonly used to control the fire. Water cannot be used to control fires involving electrical equipment or oils.
- **There are various types of combustions such as:**
- **Rapid Combustion:** A combustion, that takes place rapidly/high speed, with the production of heat and light is called rapid combustion.
- **Spontaneous Combustion:** A combustion in which a material suddenly bursts into flames, without the application of any apparent cause is called spontaneous combustion.
- **Explosion:** The process of combustion in which a large number of gases are evolved with the production of a tremendous amount of heat, light and sound is called an explosion.

There are three different zones of a flame:

- **Dark Zone:** It contains vapours of fuel and unburnt carbon particles.
- **Luminous Zone of Flame:** The middle zone of partial combustion that is yellow in colour and produces light, is called the luminous zone of flame.
- **Non-luminous Zone of Flame:** It is the outer zone of flame, that is faintly blue in colour and undergoes complete combustion of the substance.
- Fuel is a substance, which may be burnt to produce considerable heat without the formation of undesirable products.
- **Ideal Fuel:** The fuel, which fulfils all the requirements for a particular use is called an ideal fuel.
- The amount of heat energy produced on complete combustion of 1 kg of a fuel is called its calorific value. It is expressed in a unit called kilojoule per kg (kJ/kg).
- Unburnt Carbon particles in the air are dangerous pollutants causing respiratory problems. Incomplete combustion of fuel gives poisonous carbon monoxide gas.



- Increased percentage of carbon dioxide gas in air is responsible for global warming. Oxides of sulphur and nitrogen produced by the burning of coal, diesel and petrol cause acid rain which is harmful for crops, buildings and soil.
- Structure of a flame:** A flame has three zones, the outermost thin transparent faint bluish non-luminous region of complete combustion, the middle bright luminous zone of partial combustion, while the innermost is the coldest dark zone, which consists of hot vapours.
- Acid Rain:** When the pollutants like sulphur dioxide and nitrogen oxides dissolve in rainwater, it forms an acid. The rain of that acid is called acid rain.
- Calorific Value:** The amount of heat energy produced on complete combustion of 1 kg of a fuel is called its calorific value. It is expressed in a unit called kilojoule per kg (kJ/kg).
- Combustion:** A chemical process in which a substance reacts with oxygen to give off heat is called combustion.
- Deforestation:** It is the process of cutting of trees on a large scale.
- Explosion:** The process of combustion in which a large number of gases evolved with the production of a tremendous amount of heat, light and sound, is called an explosion. The flame is produced when the combustible substance vapourises during burning.
- Fire Extinguisher:** Fire extinguisher is used to control the fire. The job of a fire extinguisher is to cut off the supply of air or to bring down the temperature of the fuel, or both.
- Fuels:** A fuel is a substance, which may be burnt to produce considerable heat without the formation of undesirable products.
- Fuel Efficiency:** Fuel efficiency is expressed in terms of its calorific value which is the amount of heat energy produced on complete combustion of 1 kg of fuel.
- Global Warming:** It is the rise in temperature of the atmosphere of the earth due to the combustion of fuels.
- Ideal Fuel:** The fuel, which fulfils all the requirement for a particular use is called an ideal fuel.
- Ignition Temperature:** The lowest temperature at which a substance catches fire is called its ignition temperature.
- Inflammable Substance:** The substances, which have very low ignition temperature and can easily catch fire with a flame are called Inflammable substances.

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Chapter 7 Conservation of Plants and Animals

A great variety of plants and animals exist on earth. They are essential for the wellbeing and survival of mankind.

Deforestation means clearing of forests and using that land for other purposes. Trees in the forests are cut for some of the purposes mentioned below:

- Procuring land for cultivation
- Building houses and factories
- Making furniture or using wood as fuel

The increase in temperature on the earth disturbs the water cycle and may reduce rainfall. This can cause **droughts**. Deforestation results in the conversion of fertile land into deserts because of less

humus. This is called **desertification**.

Wildlife sanctuary, national park and biosphere reserve are names given to the areas meant for conservation and preservation of forest and wild animals.

- **Biodiversity** refers to the variety of living organisms found in a specific area. The plants and animals of a particular area are known as the flora and fauna of that area. Endemic species are those species that are found only in a particular area and not anywhere else.

The endangered species are those which are facing the danger of extinction because their numbers are diminishing. We should save, reuse and recycle paper to save trees, energy and water.

- A project, that was launched to ensure the survival and maintenance of the tiger population are called **Project Tiger**.
- **Ecosystem** is the term used for the interaction between the biotic and abiotic factors. The biotic factors of the ecosystem are plants, animals and microorganisms, while the abiotic factors are climate, humidity, air, soil, etc.
- **Biodiversity**: It refers to the variety of living organisms found in a specific area.
- **Biosphere Reserve**: The area that is meant for the conservation of biodiversity, i.e., wildlife, plant and animal resources together with the traditional life of the tribals.
- **Deforestation**: Cutting of the forests and using that land for other purposes, is called deforestation.
- **Desertification**: The soil erosion leaves less humus and makes the soil infertile, and gradually that land converts into desert. It is called desertification.



- **Ecosystem:** The interaction between the biotic (living) and abiotic (non-living) factors is called an ecosystem.
- **Endangered Animals:** Those animals, whose numbers are diminishing to a level that they might face extinction, are known as endangered animals.
- **Endemic Species:** The species of living organisms, that are found only in a particular area.
- **Extinct:** Extinct species are those species who were present in the past but now they have completely vanished.
- **Flora and Fauna:** The plants and animals, that are found in a particular area are termed as flora and fauna of that area.
- **Migratory Birds:** Migratory birds fly to far away areas every year during a particular time because of the climatic changes in that area.
- **National Park:** The reserved area for wildlife where they can freely use the habitats and natural resources.
- **Red Data Book:** The sourcebook, which keeps a record of all endangered animals and plants.
- **Reforestation:** It is restocking of the destroyed forests by planting new trees of the same species, which were existing in that forest.
- **Wildlife Sanctuaries:** There are some areas, that are reserved in a forest, and where wild animals are protected and preserved, are known as wildlife sanctuaries.

Chapter 8 Cell Structure and Functions

All organisms are the combination of different parts, i.e., called organs. Roots, stems, leaves and flowers are the organs of plants.

Hands, feet, legs, heart, kidney etc. are the organs of animals.

All organs are made up of tissues which in turn are made up of cells. Though organisms differ in shape and size, these are all made up of a basic unit called **cells**.

Cells present in living organism, differ in numbers, shape and size.

Bacteria (PPLO) has the smallest cell size of 0.1 microns. Ostrich egg has the largest **cell size of 170 mm**.

The shape of cells varies from spherical, cuboidal, columnar to long and branched types. Some cells have an irregular shape, i.e., Amoeboid shape, in case of amoeba.

There are **unicellular organisms** (bacteria) as well as multicellular organisms (plants and animals). Each cell has smaller components, called organelles. Some of these are common to different cell types. Each organelle has its own specific function.



The single cell of unicellular organisms performs all the basic functions, i.e., performed by a variety of cells in multicellular organisms.

The cell has three main parts:

- the **cell membrane**
- **cytoplasm** which contains smaller components called **organelles**, and
- the **nucleus**.

Nucleus is separated from the cytoplasm by a nuclear membrane.

Nucleus acts as a control centre for all the activities of the cell.

Nucleus contains some smaller spherical body, i.e., nucleolus and threadlike structure, i.e., **chromosomes**.

The chromosomes carry genes that help in inheritance or transfer of characters from parents to the offspring.

- **Nucleoplasm** is the liquid material of the nucleus. Cells without a well-organised nucleus, i.e., lacking a nuclear membrane, are called **prokaryotic cells**.
- Plant cells differ from animal cells in having an additional layer around the cell membrane termed as the cell wall.
- **Coloured organelle**, i.e., called plastids, are found in the plant cells only. Green plastids containing chlorophyll are called chloroplasts.
- Plant cell has a big central vacuole unlike several small vacuoles in animal cells. Cell is the basic structural and functional unit of all living organisms.
- **Cell Membrane**: Cell membrane is a membrane around the cell. It is also called the **plasma membrane**. Cell wall is a hard and rigid covering of plasma membrane and found in plant cells only.
- **Chloroplasts** are the green coloured plastids having chlorophyll, a which is essential for photosynthesis. Chromosomes are a thread like structures found in the nucleus. It carries genes. **Protoplasm** is the viscous fluid inside the cell which provides living nature to it.
- **Eukaryotes**: The organisms having eukaryotic cells, i.e., contains a well developed nucleus are called eukaryotes.
- **Gene**: Genes are located on chromosomes. Gene is a unit of inheritance in living organisms.
- **Multicellular** is the category of the organism like plants and animals, containing large number of cells.
- **Nuclear membrane**: Nucleus is separated from the cytoplasm by the nuclear membrane. Nucleolus is a smaller, spherical and dense



body inside the nucleus. Nucleus is the denser region of the cell and may be present at the centre of the cell.

- **Organ:** an Organ is a group of tissues, specialized to perform specific functions. **Organelle** is one of the smaller components of a cell.
- **Plasma membrane** is a membrane around the cell, also called cell membrane. **Plastids** are the coloured organelles, that are found in plant cells only.
- **Prokaryotes:** The organisms with prokaryotic cells, lack true nucleus; they are called prokaryotes e.g., bacteria and blue green algae.
- **Pseudopodia** are the projections protruding out of the body of amoeba. These appear and disappear as amoeba moves.
- **Tissue:** A tissue is a group of similar cells performing a specific function. Unicellular is the category of organism like bacteria containing only a single cell.
- **Vacuoles:** Are the empty or blank looking structures in the cytoplasm.
- **White blood cells (WBC):** It is one of the components of blood cells. It is an example of a single cell which can change its shape.

Chapter 9 Reproduction in Animals

Reproduction: It is one of the important life processes, which ensures the continuation of similar kinds of individuals (species) generation after generation.

Modes of Reproduction: There are two modes by which animals reproduce. These are

- Sexual reproduction and
- Asexual reproduction.

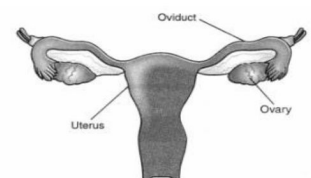
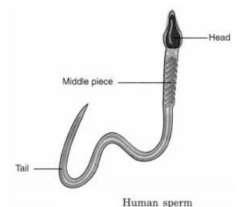
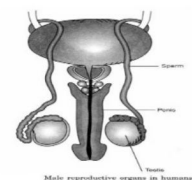
Sexual Reproduction

Male Reproductive Organs: Male reproductive organs are a pair of testes, sperm ducts, and a penis.

Sperms: The testes produce the male gametes called sperms.

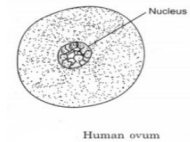
Female Reproductive Organs: The female reproductive organs are a pair of ovaries, oviducts (fallopian tubes) and the uterus.

Ova: Ovary produces females gametes called ova (Egg). In human beings, a single matured egg is released into the oviduct by one of the ovaries every month. Uterus is the part of the female reproductive system where the development of the embryo takes place.



Female reproductive organs in humans

Notes



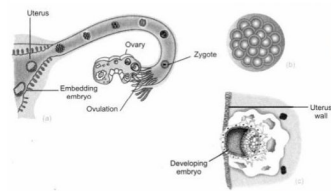
Both sperm and ova are single-celled structure. The fusion of the ovum and the sperm is called **fertilisation**. Fertilisation which takes place inside the female body is called internal fertilisation.

Fertilisation which takes place outside the body of the female is called external fertilisation. During fertilisation, the nuclei of the sperm (n) and the egg (n) are fused to form a single nucleus (2n). This fertilised egg is called **zygote**. The zygote divides repeatedly to give rise to a ball (mass) of cells. The cells then begin to differentiate into various tissues. This developing structure is called an

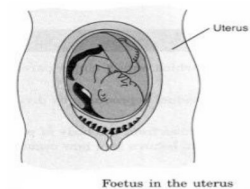
embryo.

Zygote formation and development of an embryo from the zygote

Ball of cells (enlarged) Embedding of the embryo in the uterus (enlarged).

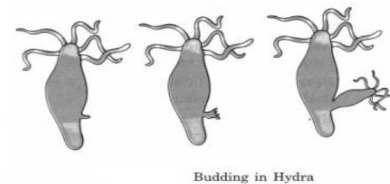


The embryo gets implanted within the wall of the uterus, i.e., endometrium for further development. The stage of the embryo in which all the body parts are identifiable is called a **foetus**.



The animals which give birth to young ones are called **viviparous** animals. The animals which lay eggs are called **oviparous** animals.

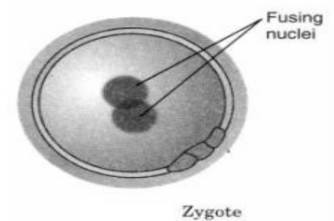
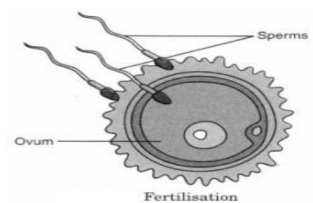
The transformation of larva into an adult through drastic changes is called **metamorphosis**.



Types of Asexual Reproduction

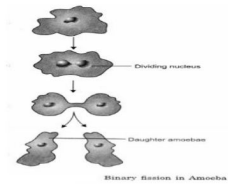
In small animals like a hydra, new individuals develop from buds. This method of asexual reproduction is called **budding**.

- **Bud:** A lateral outgrowth from the parent body that assumes the shape of parent. It ultimately gets detached and behaves as a new individual.



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- **Amoeba** a single-celled organism, reproduces by simply dividing itself into two daughter cells. This type of asexual reproduction is called **Binary fission**.



- **Asexual Reproduction:** The type of reproduction in which only a single parent is involved, is called asexual reproduction.
- **Binary Fission:** In binary fission, a single-celled individual reproduces by dividing itself into two. **Example:** Amoeba.
- **Budding:** In this type of reproduction, a lateral bud arises from the body of the parent organism, it matures and gets detached from the body to behave as a new organism.
- **Eggs:** Eggs (or Ova) are female gametes.
- **Embryo:** Zygote, during its development, divides repeatedly to form a ball of cells. The cells then form groups to form tissues and ultimately organs of the body. This structure is called embryo.
- **Fertilization:** The fusion of ovum and the sperm is called fertilization.
- **Internal Fertilisation:** Fertilisation that takes place inside the female body is called internal fertilisation. This is observed in human beings and other animals such as cows and dogs.
- **External Fertilisation:** Fertilisation that takes place outside the female body is called external fertilisation. This is common in aquatic animals such as frogs, fish, starfish, etc.
- **Foetus:** It is the stage of embryo in which all the body parts are identifiable in its developmental stage.
- **Viviparous:** Animals such as human beings, cows and dogs which give birth to the young ones are called **Viviparous animals**.
- **Oviparous:** Animals such as hen, frog and butterfly which lay eggs are called oviparous animals.
- **Tadpoles:** In the life process of a frog, we find three distinct stages, that is egg → tadpole → adult. These tadpoles get transformed into adults which are capable of jumping and swimming, and are finally transformed into frog.
- **Metamorphosis:** The drastic change which transforms a larva into an adult in case of frog is called metamorphosis. •



- **Sexual Reproduction:** The process of reproduction, which results from the fusion of male and female gametes is called sexual reproduction.
- **Sperms:** The male gametes.
- **Ova:** The female gametes.
- **Zygote:** The nuclei of sperm(n) and egg(n) are fused during fertilization, to form a single nucleus. Egg after fertilization is called **Zygote**.
- **Cloning:** Cloning is the creation of an organism that is an exact genetic copy of another. This means that every single bit of DNA is the same between the two organisms.

Chapter 10 Reaching the Age of Adolescence

Adolescence and puberty (In boys and girls).

Adolescence: The term is manipulated from a Latin word Adolescence' meaning "to grow into maturity." Whenever a kid starts crossing the age of 10 or 11, there is a sudden spurt in growth. This shows that they (boys and girls) are no longer a child but are on the way to becoming an adult.

Humans become capable of reproduction after puberty sets in. Between the ages of 11 years and 19 years, children are called adolescents. The onset of puberty brings about the growth of the reproductive organs. Hair grows at various places on the body. Breasts develop in girls and the region below the waist becomes wider, while facial hair (moustache and beard) appears in boys.

Voice of boys becomes hoarse as voice box enlarges during adolescence. Children gain height, weight and reach mental maturity and emotional maturity during adolescence.

The onset of puberty and maturity from reproductive parts are controlled by **hormones**. **Hormones** are the secretions from endocrine glands, which pour them directly into the bloodstream.

Hormones of Pituitary Gland

The pituitary gland also called **master gland**, secretes hormones like growth hormone and the hormones that stimulate other glands such as the testes, ovaries, thyroids and adrenals to secrete hormones. **For example**, Pancreas secretes insulin, the thyroid secretes thyroxine and adrenals secrete adrenalin.

Male and Female Hormones

Testosterone is the male hormone and estrogen, the female hormone. The uterine wall in females, i.e., the endometrium prepares itself to receive the developing fertilised egg. In case there is no fertilisation, the thickened lining of the uterine wall breaks down along with degenerated corpus



lutem and egg and goes out of the body along with blood. This is called **menstruation**.

- **Chromosomes:** These are thread-like structures that are present inside the nucleus of a cell and meant for carrying information from one generation to the next generation.
- **Ductless Glands:** A few glands such as sweat glands, oil glands and salivary glands release their secretions through ducts. Endocrine glands lack ducts and it releases hormones directly into the bloodstream. So they are also called ductless glands.
- **Menstruation:** If fertilisation does not occur in female, the released egg and the thickened lining of the uterus along with its blood vessels are shed off. This causes bleeding in the female which is called **menstruation**.
- **Menopause:** At 45 to 50 years of age the menstrual cycle stops. Stoppage of menstruation is termed as menopause.
- **Menarche:** The first menstrual flow begins at puberty and is termed menarche.
- **Adam's Apple:** This is the protruding part of the throat in boys which begin to grow at puberty. This is also known as the voice box or the larynx.
- **Adolescence:** It is the period of 11 to 19 years of age during which the body undergoes different changes because of hormonal effect, leading to reproductive maturity.
- **Adrenalin:** It is the hormone secreted by Adrenalin glands that helps the body to adjust to stress when one is very angry, embarrassed or worried.
- **Balanced Diet:** A diet which contains all the necessary nutrients such as proteins, carbohydrates, fats and vitamins in proper proportions is called a balanced diet.
- **Endocrine Glands:** There are certain glands that lack ducts in it and are responsible for the secretion of the chemical substance, called **hormones**. They pour their secretion directly into the bloodstream. They are called **endocrine glands**.
- **Estrogen:** This is the female sex hormone produced by ovaries, which causes the breasts to develop.
- **Hormones:** These are chemical substances which are secreted from endocrine glands to trigger the general effect on the body.
- **Insulin:** Insulin is a hormone secreted from the pancreas to hydrolyse the sugar content in the body.
- **Larynx:** At puberty, the voice box or the larynx begins to grow.

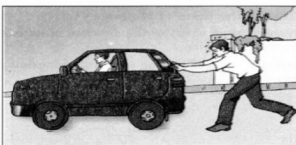


- **Pituitary Gland:** It is the gland that secretes hormones which include growth hormone and hormones that make other glands such as the testes, ovaries, thyroids and adrenals, to secrete hormones. It is also called a **master gland**.
- **Puberty:** The age in which the human body undergoes several changes and the boys and girls show their capability to reproduce.
- **Reproductive Health:** Personal health and hygiene of adolescents must be given proper care. Girls should take special care of cleanliness during the time of menstrual flow.
- **Secondary Sexual Characters:** Developed breasts in girls and facial hair in boys etc. are called the Secondary Sexual Characters.
- **Sex Chromosomes:** One pair out of 23 pairs of chromosomes in human beings are Sex Chromosomes because they are responsible for sex determination.
- **Target sites:** Endocrine glands release hormones into the bloodstream to reach a particular body part fraction called Target Site.
- **Testosterone:** This is the male sex hormone released by the testes at the onset of puberty.
- **Thyroxine:** Thyroxine is a hormone secreted from the thyroid gland.
- **Voice Box:** Voice producing part of the throat is called voice box or larynx.

Chapter 11 Force and Pressure

A push or pull exerted by an object on another is a force.

Force arises due to the interaction between at least two objects.



A car being pushed by a man

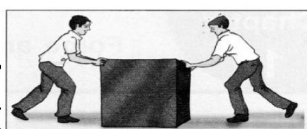
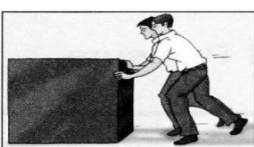


Two girls pushing each other



Two girls pulling each other

Force has both **Magnitude** and **Direction**. Force applied on an object in the same direction add to one another. If the two forces act in the opposite direction on an object, the net force acting on it is the difference between the two forces. In general, more than one force may be acting on an object at any given point. However, a force acting on an object is always the mean net force acting on it.



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Two friends pushing a heavy load (a) in the same direction and (b) in the opposite direction A Force can Change the State of Motion

A change in the speed of an object or the direction of its motion or both implies a change in its state of motion. Force acting on an object may bring a change in its state of motion or a change in its shape.

To move a tyre faster it has to be pushed repeatedly. A magnet can exert a force without being in contact with it. The force exerted by a magnet is an example of a **non-contact force**.



- **Thrust:** The force that acts on a surface in a direction perpendicular to it, is known as thrust.
- **Pressure:** Thrust per unit area is called pressure. So, pressure = force/area on which it acts. Liquids exert pressure on the walls of the container in which they are kept. Gases exert pressure in all directions.
- **Electrostatic force:** A force exerted by a charged body on another charged or uncharged body is known as electrostatic force.
- **Atmospheric pressure** is defined as the pressure exerted on a surface by the weight of air above that surface.
- **Atmospheric Pressure:** The pressure exerted by atmospheric air around us is known as atmospheric pressure.
- **Contact Force:** A force that can be applied only when it is in contact with an object is called a contact force. **For example**, hammering a nail.
- **Electrostatic Force:** When a charged body, either having a (+) or (-) charge, exerts force on another charged or uncharged body, that force is known as electrostatic force.
- **Force:** Simply a push or pull exerted by an object on another is a force.
- **Friction:** The force of friction always acts on all the moving objects and its direction is always opposite to the direction of motion.
- **Gravitational Force:** The force exerted by the earth to pull the objects towards itself is called the force of gravity.



- **Gravity:** Every object in the universe, whether small or large, exerts a force on every other object. This force is called the force of gravity or just gravity.
- **Magnetic Force:** The force exerted by a magnet to pull/push a metallic object is called magnetic force.
- **Muscular Force:** The force resulting due to the action of muscles is known as muscular force. **For example**, writing, cutting vegetables.
- **Non-Contact Forces:** A force that can be applied without any contact between two objects is called non-contact force. **For example**, the magnet pulls the iron pieces.
- **Pressure:** The force acting on per unit area, applied to an object in the direction perpendicular to the surface is called pressure.

Chapter 12 Friction

Friction opposes the relative motion between two surfaces in contact. It acts on both the surfaces.

Factors Affecting Friction

- Friction depends on the nature of surfaces in contact.
- For a given pair of surfaces, friction depends upon the state of smoothness or roughness of those surfaces. It is less for smooth surfaces.
- Friction is independent of the area of contact.
- Friction depends on how hard the two surfaces pressed together.

The force required to overcome friction at the instant an object starts moving from rest is called **static friction**. Sliding friction is less than static friction.

Friction is a must as well as evil:

- Friction produces heat when we vigorously rub our palms together for a few minutes.
- Friction is responsible for wear and tear of various parts of machines.
- Friction decreases the efficiency of machines as a part of the machine's energy is lost in extra friction.
- Friction is responsible for writing, walking and transmitting energy.
- Friction is responsible for starting or stopping.



- Friction is used in gripping or holding an object with our hands. So, we can say friction is a must as well as evil. Friction is important for many of our activities.
- Friction can be reduced by using: grease, oil, powder, ball bearing, and cushion of dry air between the moving surfaces using anti-friction alloys.

Friction can be increased by making a surface rough. The sole of the shoes and the tyres of the vehicle are treated to increase friction.

Fluid Friction can be minimised by giving suitable shapes to bodies moving in fluids.

To overcome fluid friction bodies of fish and birds are streamlined. Similarly, the ships and aeroplanes are also made streamlined.

- **Ball Bearing:** Ball bearings reduce friction. They are used between hubs and the axles of ceiling fans and bicycles.
- **Drag:** The frictional force exerted by fluids is also called drag.
- **Fluid Friction:** Fluid exerts the force of friction on objects in motion through them.
- **Friction:** Friction is the form of force, which opposes the relative motion between the two surfaces in contact and it acts on both the surfaces.
- **Interlocking:** Irregularities on two surfaces in contact may clasp with each other, increasing friction.
- **Lubricants:** The substances which reduce friction are called lubricants.
- **Rolling Friction:** When one body rolls over the surface of another body, the resistance to its motion is called the rolling friction.
- **Sliding Friction:** When one surface is sliding over the other surface, sliding friction comes into play.
- **Static Friction:** Static friction comes into play to counterbalance the applied force on the body.

Chapter 13 Sound

Sound plays an important role in our daily life. It helps us to communicate with one another and express yourself. Sound is produced by vibrating the objects and it is carried in all directions with the help of a medium.

Sound needs a medium to travel. It cannot travel in a vacuum.

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We hear sound through our ears. The eardrums of our ears sense the vibrations produced by a vibrating object and send them to the brain as the stimulus. This process is called a **hearing**.

Frequency: The number of oscillations or vibrations per second is called the **frequency of oscillation**.

Noise Pollution: The presence of excessive or unwanted sound in the atmosphere is called noise pollution.

Major causes of noise pollution are sounds of vehicles, explosions including the bursting of crackers, machines, loudspeakers etc.

Presence of excessive noise in the surroundings may cause many health-related problems e.g., lack of sleep, hypertension and anxiety etc. Plantation on the roadside and elsewhere is the best source to reduce the noise pollution.

The loudness is expressed in a unit called decibel (dB). It also depends on the amplitude of the sound.

- **Amplitude:** The maximum distance to which a vibrating body moves on either side of its mean position is called the amplitude of vibration.
- **Audible Frequencies:** For human ears, the range of audible frequencies is roughly from 20 to 20,000 Hz.
- **Eardrum:** A thin membrane which is stretched tightly to receive the waves of sound at the end of ear canal.
- **Hertz:** The frequency is expressed in hertz (Hz).
- **Larynx:** In humans, the sound is produced by the larynx.
- **The loudness of Sound:** Larger the amplitude of vibration, louder is the sound.
- **Noise:** Unpleasant sounds are called noise.
- **Oscillation motion:** The to and fro motion of an object is called oscillation motion.
- **Pitch of the Sound:** Higher the frequency of vibration, the higher is the pitch, or shrill of the sound.
- **Shrillness:** The frequency determines the shrillness or pitch of a sound. If the frequency of vibration is higher we can say that sound is shrill.
- **Time Period:** The time taken by a pendulum to complete one oscillation is called the time period.
- **Vibration:** The to and fro or back and forth motion of an object is termed as vibration.



- **Voice Box:** Upper end of the windpipe, below the hard part on the throat is called the voice box.
- **Windpipe:** It is the passage for the inlet and outlet of air in the lungs.

Chapter 14 Chemical Effects of Electric Current

Some liquids are good conductors of electricity and some are poor conductors. Most liquids that conduct electricity are the solution of acids, bases and salts.

Water: A Conductor or Insulator: The water that we get from sources such as tap, hand pumps, wells, ponds is not pure but a solution. The small number of mineral salts are naturally present in it. This water is thus a conductor of electricity. On the other hand, distilled water is free of salts, and thus an insulator.

Due to the heating effect of current, the filament of the bulb of the tester gets heated to a high temperature and it glows. Light emitting diodes (LED) glow even when a weak electric current flows through it.

Chemical Effects of Electric Current: The passage of an electric current through a conducting solution causes the chemical reaction. The resulting effects are called chemical effects of current.

Electroplating is an example of a chemical effect of current. **Applications of Electroplating:** Electroplating is a very useful process. It is widely used for coating many metal objects and parts with a thin layer of a different metal.

Electrode: It is the metallic rod/conductor through which electricity enters or leaves an electrolyte.

Electroplating: The process of depositing a layer of any desired metal on another metallic object, by means of electricity, is called electroplating.

Good Conductors: The materials that allow the electric current to pass through them, are conductors of electricity. For example: Metals such as copper, aluminium.

LED: These are Light Emitting Diodes that contain two wires called leads. One lead slightly longer is always connected to the positive terminal of battery while the other lead is connected to the negative terminal of the battery.

Poor Conductors or Insulators: The materials, which do not allow an electric current to pass through them easily, are insulators. For example Rubber, plastic and wood.



Chapter 15 Some Natural Phenomena

Some objects can be charged by rubbing with other objects.

Static Electricity: The chemical charge generated by rubbing is called static electricity because these charges do not transmit.

There are two types of charges-positive charge and negative charge.

When we rub two objects, made of different substances, together the charge they acquire are opposite to each other.

Electric Current: When charges move they constitute an electric current.

Earthing: The process of transfer of charges from a charged object to the Earth is called earthing. Earthing is provided in electrical wiring in building to protect us from electrical shocks, in case of any leakage of electrical current. The process of electric discharge between clouds and the earth or between different clouds causes lightning. **Lightning strike** could destroy life and property.

Lightning conductor's can protects buildings from the effects of lightning.

An earthquake is a sudden shaking or trembling of the Earth.

Earthquake is caused by a disturbance deep inside the Earth's crust.

It is not possible to predict the occurrence of an earthquake.

Earthquakes tend to occur at the boundaries of Earth's plates. These boundaries are known as fault zones.

- **Destructive energy** of an earthquake is measured on the Richter scale. The earthquake measuring 7 or more on Richter scale can cause severe damage to life and property.
- **Crust:** Crust is the uppermost layer of Earth's surface (8 km - 32 km).
- **Electric discharge:** When negative charges from the clouds and positive charges on the ground meet, a huge amount of energy is produced as bright light and sound, which we see as lightning. The process is called electric discharge.
- **Earth's Plates:** The outermost layer of the earth is not in one piece. It is fragmented. Each fragment is called a plate.
- **Earthquake:** An earthquake is a sudden shaking or trembling of the Earth. It is caused by a disturbance deep inside the earth's crust (i.e., by the movement of Earth's plates).
- **Electroscope:** Electroscope is a device used to test whether an object is carrying charge or not.
- **Lightning:** The process of electric discharge between clouds and the Earth or between different clouds causes lightning.



- **Lightning Rod:** Lightning rod is a device used to secure tall buildings from the effect of lightning conductor. A metallic rod taller than the height of the building is installed in the walls of the building during its construction to protect it from the effect of lightning.
- **Negative Charge:** When the charge of an object is due to the excess of electrons, it is called a negative charge.
- **Positive Charge:** When the charge of an object is due to the loss of electrons, it is called a positive charge.
- **Richter Scale:** The power of an earthquake is expressed in terms of magnitudes on a scale called the Richter Scale.
- **Seismograph:** The seismic waves are recorded by an instrument in the form of a graph called the seismograph.
- **Thunder:** The loud noise which accompanies lightning.
- **Thunderstorm:** A storm accompanied by thunder and lightning.
- **Transfer of Charge:** Electrical charge can be transferred from a charged object to another through a metal conductor.
- **Tsunami:** Earthquakes may cause tsunamis in oceans, resulting in huge damage in coastal areas.
- **Tremor:** Trembling or shaking of the Earth.

Chapter 16 Light

Our eyes alone cannot see any object. It is possible only when light reflected from an object enters our eyes. The light by which we can see an object may have been emitted by the object (if the object is luminous) or may have been reflected by the object (if the object is

non-luminous). Light is reflected from all surfaces.

Regular reflection takes place when light is incident on smooth, polished and regular surfaces.

Diffused/irregular reflection takes place from rough surfaces.

Images are formed by regular reflection. The ray of light which falls on a mirror is called incident ray. The ray which comes back from the surface of a mirror after reflection is known as a reflected ray. A

perpendicular line at the point of incidence is called normal.

The image formed in a plane mirror undergoes lateral inversion.

Two mirrors inclined to each other give multiple images.



Beautiful patterns are formed in a kaleidoscope because of multiple reflections. Sunlight, called white light, consists of seven colours.

Splitting of light into its constituent colours is known as dispersion.

A human eye consists of various parts—Cornea, Iris, Pupil, Eye lens, Retina, Optic nerves.

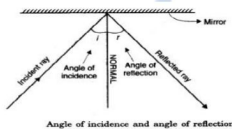
If the eye lens becomes opaque, the eyesight becomes foggy. This disease is called a **cataract**. It can be treated by removing the opaque lens and inserting a new artificial lens.

The most comfortable distance at which one can read with a normal eye is 25 cm. The impression of an image persists on the retina for about $\frac{1}{10}$ of the second.

Night blindness is the most common eye problem and it happens due to vitamin A deficiency.

Angle of Incidence: The angle between the normal and the incident ray is called the angle of incidence.

- **Angle of Reflection:** The angle between the normal and the reflected ray is called the angle of reflection.



- **Blind Spot:** At the junction of the optic nerve and the retina, there are no sensory cells, so no vision is possible on that spot. This is called the blind spot.
- **Braille System:** It is the most popular resource for reading and writing of visually challenged persons developed by Louis Braille.
- **Cones:** Cones are nerve cells on retina, which are sensitive to bright light and sense colour.
- **Cornea:** It is the transparent front part of the eye.
- **Diffused Reflection:** The light reflected from non-polished surfaces is also scattered back. But the light reflected from them is not in a well-defined direction. It spreads out in all directions. This is called Diffused reflection.
- **Dispersion of Light**
 - Sunlight known as white light consists of seven different colours.
 - Splitting of light into its constituent colours is known as dispersion.
 - Prism can split light into its constituent colours. Iris is the coloured part of the eye. It controls the size of the pupil.
 - **Kaleidoscope:** There is an interesting device based on the principle of multiple reflections in inclined mirrors. It is called Kaleidoscope.



- **Lateral Inversion:** Phenomenon of changing side left to right and right to left by the mirror while forming images is called Lateral inversion.
- **Laws of Reflection**
- The two laws of reflection are as follows:
- The incident ray, the normal and the reflected ray all lie on the same plane at the point of incidence.
- The angle of reflection is always equal to the angle of incidence. ($\angle i = \angle r$).
- The pupil is a small opening in the cornea. Regular Reflection: Reflection from a smooth surface like that of a mirror is called **regular reflection**. The retina is the site of the formation of an image.
- **Rods:** Rods are the nerve cells on retina, which are sensitive to dim light.
- **Reflection of Light:** Scattering back of the light, when falls on shining and smooth surfaces, is called reflection.

Chapter 17 Stars and the Solar System

We can see many celestial bodies in a clear night sky. Stars are one of the celestial bodies which emit light of their own.

The moon is a natural satellite of the Earth. It revolves around the Earth on its orbit. The different shapes of the bright visible part of the moon as seen from the Earth are called phases of the moon.

Sun is also one of the stars which emits light and is a great source of heat. It is the closest star and is the centre of our solar system.

Constellations: The group of stars which appear to form some recognizable shape or pattern is known as a constellation. These groups of stars or constellations are named after the objects which they seemed to resemble such as an animal, a human being.

The stars are millions of km far from Earth and from each other. Such large distances are expressed in a unit known as light year. It is the distance travelled by light in one year, i.e., 9.46×10^{12} km.

Stars are many light years away from the Earth and thus they look very small from Earth.

Stars appear to travel from east to west. Pole star is the most shining star in the night sky. The pole star appears to be stationary. It is situated near the axis of rotation of Earth and is thus helpful in

finding direction.



Other important parts of the night sky are planets. Planets revolve around the Sun. Our solar system consists of eight planets revolving around the Sun. It also consists of many other celestial bodies like asteroids, comets and meteors.

Inner or Terrestrial Planets: First four planets Mercury, Venus, Earth and Mars are much nearer to the Sun and have less number of satellites. They are called the inner planets. These are also called terrestrial planets because their structure is rocky similar to that of Earth.

Jovian Planets: The planets outside the orbit of Mars, namely Jupiter, Saturn, Uranus and Neptune are called outer planets because they are much farther off than inner planets. They are also known as Jovian planets because their structure is gaseous and are similar to that of Jupiter.

Comets are the celestial bodies that revolve in highly elliptical orbits around the Sun. A bright streak of light in a night sky are commonly called shooting stars or meteors.

Important facts about the Planets

Mercury (Budha)

It is the closest planet to the Sun. Its distance from Sun is 57×10^6 km. Since it is very close to the Sun, most of the time it is hidden in the glare of the Sun. It can be visible before the Sunrise in the east and after the Sunset in the west.

It appears quite bright and correspondingly it is termed as 'morning star' and 'evening star'. It is termed as a star because it appears very bright in the sky. It is of the same size as the moon. It revolves around the Sun in 88 days and takes 58 days to complete one rotation on its axis. Life cannot exist on mercury due to lack of atmosphere and extreme temperature

$[340^\circ\text{C} \Leftrightarrow (-150^\circ\text{C})]$ and it has no protective blanket around it to save it from harmful radiations. The surface features of mercury resemble those of moon more than those of the

Earth.

It has no moon or satellite of its own.

Venus (Shukra)

- Its distance from the Sun is 108×10^6 km.
- It completes its Orbit around the Sun in 225 days.
- It has almost the same radius, density and mass as that of Earth. Thus, it is called the twin of Earth.
- It is the brightest planet and appears as a morning and evening star.
- The surface temperature of Venus is about 450°C and it is covered by a thick blanket of cloud made up of CO_2 , H_2 , O_2 , N_2 .



- NO life is possible on this planet because of high temperature, absence of water and insufficient oxygen.
- It has no moon or satellite of its own.

The Earth (Prithvi)

- Its distance from the Sun is 149×10^6 km.
- It has plenty of water, oxygen in the atmosphere and is neither too cold nor too hot, making life possible on this planet.
- It takes 365 days to complete one revolution around the Sun and 24 hours to complete one rotation on its axis.
- It has a thick blanket of the ozone layer high up in its atmosphere to save the life from harmful effects of ultraviolet radiations coming from the Sun.
- It has one satellite called the moon.

Mars (Mangal)

- Its distance is 227×10^6 km from the Sun.
- It takes 687 days to complete one revolution around the Sun and 24 hours to complete one rotation on its axis.
- It has a reddish appearance.
- It has two natural satellites or moons named Phobos and Deimos.
- Unlike Mercury and Venus it can be seen in any part of the night sky.
- The day temperature varies from 5°C to 15°C and there is no evidence as yet of life on Mars.
- It has no protective blanket to protect it from harmful solar radiations.

Jupiter (Brihaspati or Guru)

- Its distance from the Sun is 778×10^6 km.
- It takes 12 years to complete one revolution around the Sun.
- It is the largest planet and is more massive than the combined mass of other planets of the solar system.
- It has dozen satellites or moons. Four of them are quite large and bright and can be seen with a low power telescope.
- There is a faint ring consisting of extremely small particles around Jupiter.

Saturn (Shani)

- After Jupiter, Saturn is the second biggest planet of the solar system.



- It looks like a large yellow star to the naked eye.
- It possesses well-developed set-of rings around it. These rings consist of particles whose sizes vary from tiny specks to rocks measuring a few kilometres in diameter.
- It is at a distance of 1427×10^6 km from the Sun.
- It takes about 29.5 years to complete one revolution around the Sun.
- It is said to have 30 satellites or moons of its own. u-U)

Uranus (Arun)

- This is the seventh planet from the Sun and is 2870×10^6 km away from the Sim.
- It takes 84 years to complete one revolution around the Sun.
- It has 21 satellites or moons of its own.
- It rotates about its axis from east to west in contrast to other planets which rotate from west to east.
- Its atmosphere contains hydrogen and methane.

Neptune (Varun)

- It is the eighth planet in terms of its distance from the Sun.
- It has 8 satellites revolving around it.
- Its distance from Sim is 4504×10^6 km.
- It takes 165 years to complete one revolution around the Sim.

Artificial Satellites

- The artificial satellites revolve around the Earth much closer than the moon.
- Artificial satellites are used for weather forecasting, long-distance communication and remote sensing.
- **Asteroids:** There is a large gap between the orbits of Mars and Jupiter. This gap is occupied by a large number of small objects which revolve around the Sim. These are called asteroids.
- **Astronomy:** The study of celestial objects and associated phenomena is called astronomy.
- **Cassiopeia:** Cassiopeia is a constellation, which is visible in winter in the northern sky. It looks like a distorted letter W or 'M'.
- **Celestial Objects:** Objects, such as the stars, the planets, the moon and many other objects in the sky are called celestial bodies.
- **Comets:** Comets are celestial bodies that revolve around the Sun in highly elliptical orbits. A comet appears generally as a bright head



with a long tail. The tail of a comet is always directed away from the Sun.

- **Constellations:** A group of stars appearing in different shapes is called constellation. Their shapes resemble different objects and thus are named after the name of the objects.
- **Light Year:** Distance travelled by light in one year.
- **Meteors:** A meteor is usually a small heavenly object moving around the Sun. When a meteor occasionally enters the Earth's atmosphere, it gets heated up because of friction and glows but evaporates in a very short period of time. That is why, they appear as a bright streak in the sky.
- **Meteorites:** Some meteors are so large that a part of them reaches the surface of the Earth before they evaporate completely. These are called meteorites.
- **Natural Satellites:** A natural celestial body revolving around another celestial body (say planets) is called natural satellite.
- **Orbit:** A planet revolves around the Sun in a definite path. This path is known as the orbit of the planet.
- **Orion:** Orion is a constellation of 7 or 8 stars which looks like a hunter.
- **Phases of Moon:** The various shapes of the right part of the moon as seen during a month are called phases of the moon.
- **Planets:** Planets are the celestial bodies which revolve around the Sun in a well defined orbit.
- **Pole Star:** It is the only star which always appears to remain in the same position in the sky.
- **Remote sensing:** Artificial satellites are used for weather forecasting, long distance communication and remote sensing.
- **Solar System:** The Sun and the celestial bodies which revolve around the Sun form the solar system.
- **Stars:** Stars are the celestial bodies, which emit light of their own. The Sun is also a star.
- **Ursa Major:** It is a group of seven stars and is also known as "Saptarishi."



Chapter 18 Pollution of Air and Water

Air consists of a mixture of gases. By volume, about 78% of this mixture has nitrogen gas and about 21% is oxygen. Carbon dioxide, argon, methane, ozone, water vapour are also present in very small quantities.

Air Pollutants: The substances which contaminate the air are called air pollutants. Pollutants may come from natural sources (as forest fires or volcanic eruptions) as well as by human activities.

Carbon monoxide, nitrogen oxides, carbon dioxide, methane and sulphur dioxide are the major pollutants of air.

Carbon Monoxide

- It is produced by the incomplete burning of fossil fuels such as petrol, diesel, etc.
- It is a poisonous gas, it reduces the capacity of the blood to transport oxygen. Smog
- It is made up of smoke and fog. Smoke is made up of oxides of nitrogen and other pollutants.
- It causes breathing difficulties such as asthma, cough and wheezing in children.

Sulphur Dioxide

- It is produced by combustion of fuels like coal in power plants. Petroleum refineries are a major source of gaseous pollutants like sulphur dioxide and nitrogen dioxide.
- It can cause respiratory problems including permanent lung damage.
- **Chlorofluorocarbons (CFCs)**
- These are used in refrigerators, air conditioners, and aerosol sprays.
- CFCs damage the ozone layer of the atmosphere.
- **Tiny Particles**
- These particles are produced by industrial processes like steel making and mining. These remain suspended in the air for long periods and reduce visibility.
- **Acid Rain:** Oxides of sulphur and nitrogen react with water vapour present in the atmosphere to form sulphuric acid and nitric acid. When these come down with the rain, it makes the rain acidic. This is called acid rain.
- **Marble Cancer**
- Acid rain has resulted in corrosion of the marble of the Taj Mahal. The phenomenon is called Marble cancer. **Suspended Particulate**



Matter (SPM) emitted by the Mathura Oil Refinery, has contributed to the yellowing of the marble.

- An increasing amount of carbon dioxide gas in the atmosphere is responsible for global warming. It has resulted in rising in sea-levels, reduction in rainfall and proved to be a serious threat to the existence of life on the Earth.
- **Greenhouse gases:** Besides CO₂, other gases like methane, nitrous oxide, water vapour also contribute to the greenhouse effect. They are also called Greenhouse gases.
- **Water Pollutants:** Sewage, agricultural chemicals and industrial waste are some of the major contaminants of water.
- **Ganga Action Plan:** It is an ambitious plan to save the river, Ganga. It was launched in 1985.
- **Water Conservation:** Water is a precious natural resource. We must learn how to conserve it, following the mantra – reduce, reuse and recycle (3Rs).
- **Air Pollution:** When the air is contaminated by unwanted substances which have a harmful effect on both the living and non-living components, it is referred to as air pollution.
- **Chemical Contamination:** Discharge of harmful chemicals into rivers and streams causing pollution of water is called chemical contamination.
- **Global Warming:** The average temperature of the Earth's atmosphere is gradually increasing due to increasing levels of greenhouse gases like CO₂. This is called global warming.
- **Green House Effect:** The trapping of radiations by the Earth's atmosphere due to increasing levels of gases like CO₂ is called the greenhouse effect.
- **Pollutants:** Pollutants are the substances which cause pollution.
- **Potable Water:** Water which is purified and fit for drinking is known as potable water.
- **Water Pollution:** Water-pollution is the contamination of water by those substances which are harmful to life.

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